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ABSTRACT

It was hypothesized that a structured analysis of pupil outcomes will improve the attitudes and performance of prospective teachers. This procedure, known as Product Analysis, is a self-regulation technique based on the assumption that teachers who are able to monitor the effects of their teaching behavior on student achievement will alter that behavior appropriately to maximize positive effects. Two groups of prospective teachers were used as subjects to test this hypothesis. One group received training in using the Product Analysis technique, the other did not. Subsequent test results of the two groups indicated significant behavior change in the training group and substantially high pupil achievement. (JD)

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USING PRODUCT ANALYSIS TO DEVELOP SELF-IMPROVEMENT SKILLS IN CBTE PROGRAMS

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USING PRODUCT ANALYSIS TO DEVELOP SELF-IMPROVEMENT SKILLS IN CBTE PROGRAMS

Many experts in CBTE programs maintain that certification standards in these programs can be raised by requiring that prospective teachers demonstrate the ability to produce pupil outcomes prior to certification of the type which they will be required to produce in schools following certification. These experts claim that current practices of certifying teachers on the basis of their having demonstrated acceptable standards of teaching competencies alone is not enough, and that inferences made about relationships between teaching competencies and pupil outcomes are not valid (McNiel, Popham, 1973; Peck, Turner, 1973; Rosenshine, Furst, 1973; McDonald, 1974; McDaniels, 1974; Schalock, 1972). Other experts suggest that pupil outcomes be used to increase certification standards because they view this as an appropriate response to increased citizen demands that achievement scores in basic school subjects be raised, and that teacher education institutions turn out fewer, but better prepared teachers.

Arguments against the use of pupil outcomes in certification procedures center around shortcomings in available test instruments and procedures. The major arguments against using pupil outcome measures to certify teachers are: 1) Existing instruments have not been demonstrated to be reliable, 2) Existing instruments

measure limited short range teaching objectives, and cannot be used to measure long range social and psychological objectives of the schools, and 3) Instructional settings vary such that it is impossible to make valid predictions from test settings to future school settings in which graduates will be operating. A further argument against using pupil outcomes in teacher assessment is that current belief about evaluation stress its improvement function not its assessment functions. It is believed that pupil outcome measures will be used to assess teachers, and will not contribute towards their improvement.

This paper will describe a study which is designed to solve some of the problems which arise from the use of pupil outcomes in certifying teachers. The objective of the study is to demonstrate that the performance and attitudes of prospective teachers is increased by the use of pupil outcomes in certification procedures. The study has been underway at Illinois State University since 1973 (Waimon, Ramseyer, Eastman, 1975), and the present paper reports work which has been done during the 1976-1977 academic year. Many of the original instruments and procedures used in this study were developed at U.C.L.A. by McNiel and Popham (McNiel, Popham,1973; Popham, 1975). However, adaptations and additions to these instruments and procedures have been made at Illinois State University.

Problem

Popham (1972) described instruments and procedures which enabled prospective teachers to use pupil outcomes for self-improvement purposes. Popham's treatment consisted of teaching performance tests with a prespecified class performance level stated in the objective of the test which was administered to prospective teachers on a pre- to posttest basis. Self-improvement skills are assessed two ways, horizontally, by comparing the prespecified class performance stated in the test objective against the actual mean scores generated by a learner group following a brief teaching session, and, vertically, by the increase from pre- to posttest following a reteach of the same lesson to a different random sample learner group. However, Popham did not help prospective teachers to analyze pupil outcomes pre- to posttest, and did not set minimum standards of acceptable performance. It would appear that both elements are necessary in the development of self-improvement skills in prospective teachers. Investigations over the past decade into a wide range of training situations from classroom to outpatient settings indicate that behavioral self-regulation requires maximum feedback information of the effects of target behavior on environment, and standards which can be used to award reinforcement if the performance of the target behavior exceeds or matches standards or to withhold reinforcement if the standard is not met (Jones, Nelson, Kazdur, 1977).

The intervention strategy developed at Illinois State University to help prospective teachers use pupil outcomes for self-improvement purposes is called product analysis. Product analysis is a behavioral self-regulation technique which is based on the assumption that prospective teachers who are able to monitor the effects of their teaching behavior on pupil outcomes will alter that behavior appropriately in order to maximize positive effects. Product analysis is a three step sequence in which the prospective teacher measures the effects of his teacher behavior on pupil outcomes using teaching performance tests administered pre- to posttest; compares performance feedback to prespecified class performance levels, and makes an item by item analysis of each pupil's response; alters his performance on the reteach cycle, and is reinforced for achieving standards which have been established to determine minimum acceptable levels of self-improvement skills. Item analysis of pupil scores yields additional information over the examination of mean scores alone, and a hierarchical arrangement of minimum acceptable performance standards establishes a schedule of reinforcement with enough power to enable prospective teachers to acquire a complex human behavior like teaching. Our hypothesis in this study is that prospective teachers that receive product analysis training will score higher on tests of teacher effectiveness, and show more positive attitudes towards their

training than prospective teachers that receive alternative training.

Procedures

The Professional Sequence at Illinois State University is a self-paced CBTE program. All prospective secondary teachers at Illinois State University must complete Sequence requirements prior to certification. These requirements consist of individualized learning packages covering general methods topics which are usually prerequisites for student teaching. These individualized learning packages can be grouped into three behavioral repertoires called planning, guiding, and evaluating learning. During the 1976-1977 academic year students were allowed to volunteer for an alternative to this individualized Sequence program. Volunteers were randomly assigned to one of two groups. The control group supplemented the regular Sequence individualized learning packages with large group instruction on Sequence packages. The experimental group supplemented the regular Sequence packages with product analysis training. Both groups were taught by regular Sequence staff members that agreed to participate in this experiment.

Subjects

Subjects (N=59) were junior or senior prospective secondary teachers drawn from 32 departments at Illinois State University. The experimental population (n=29) consisted of the total group randomly assigned to the instructor that had agreed to administer product analysis training. Due to administrative problems the

control population (n=10) were randomly selected from the total group of students assigned to the Sequence instructor that had agreed to teach the control group. Attendance in the control group was not required by the instructor, and it was difficult to obtain criterion measures on all subjects in the control group. This factor set serious limitations on the design of this experiment, and served to weaken the liklihood that the analysis of variance would be significant.

Method

Subjects in the experimental group were informed that they had to take the criterion test for each Sequence package. However, they would not receive the merits assigned to that package until they had satisfactorily passed a teaching performance test which included all of the teaching competencies studied just prior to the test. Subjects that failed the criterion test for a Sequence package were given the option of proceeding to the next package in the linear program without having to retake the package criterion test. In this way subjects were allowed to decide if not passing the criterion test for a particular package might jeopardize their performance on the repertoire teaching performance test. There were three behavioral repertoire teaching performance tests lasting about two weeks each. About four weeks were devoted to the study of Sequence packages preceeding each behavioral repertoire test. In this way the semester's work was divided into three six week units.

In Test I, subjects were required to construct a teaching performance test in his subject-matter field similar in format to that developed by Popham (1972). The test objective was at the knowledge or comprehension level with a prespecified class performance level of 55 percent stated in the objective. After teaching his lesson until the prespecified class performance level was attained subjects were given a set of instructions, and used these to conduct an item analysis of achievement scores. Subjects were then required to reteach the same lesson to a different random sample learner group until a 10 percent gain in pupil outcomes was achieved pre- to posttest. In Tests 2 and 3, procedures duplicate Test 1, with the exceptions that the magnitude of the teaching performance test objective is increased, and the percentage of gain pre- to posttest is larger. In Test 2, the teaching performance test objective is raised to the application and analysis levels with a prespecified class performance of 60 percent. A 15 percent posttest increase was required. After teaching his lesson, subjects were required to perform item analysis on attitude measures obtained from the learner groups. In Test 3, the teaching performance test objective is raised to the synthesis and evaluation levels with a prespecified class performance of 65 percent. A 20 percent posttest increase was required. Item analysis on achievement and attitude scores were performed. These treatments are summarized in Figure I.

Figure I

Experimental Treatment Summary (1976-77)

Test Specifications	Repertoire Tests		
	1	2	3
1. Test Level a. Objective b. Class Performance	Knowledge/ Comprehension 55%	Application/ Analysis 60%	Synthesis/ Evaluation 65%
2. Item Analysis	Achievement Scores	Attitude Scores	Achievement/ Attitude Scores
3. Gains Pre- to Posttest	10%	15%	20%

Data Source

The criterion measures were nine teaching performance tests included in the Teaching Improvement Kit, Adult Forms A, B, and C developed at U.C.L.A. (Popham, 1972). Criterion measures were administered to subjects in the control and experimental groups pre- to posttest. Subjects were randomly assigned to the Popham tests and learner groups were randomly assigned to subjects. All Popham tests were assumed to be of comparable difficulty. The basic raw scores generated were the mean performance of each group of pupils for each subject on the nine Popham teaching performance tests. Attitudinal measures were obtained from each subject at the end of treatment. The instrument used was a five-point rating scale developed at Illinois State University to obtain student ratings of courses. Student ratings were anonymous.

Results

The principal analysis centered on learner group performance on the achievement tests included with each of the nine Popham teaching performance tests. As predicted he experimental group outperformed controls. In Table I the means and standard deviations of the 39 subjects are presented.

Table I

TEST OF SIGNIFICANCE FOR EXPERIMENTAL AND CONTROL GROUPS ON POPHAM TEACHING PERFORMANCE TESTS

Group	N	Pre Mean	Post Mean	Mean Gain	S.E.	t
Experimental	29	57.45	71.34	13.90	2.70	5.14***
Control	10	63.40	68.70	5.30	3.63	1.46N.S.

$P < .001$, $5._{995}$ (df=28) = 3.67

As can be seen in the comparisons the experimental group achieved a significant gain from pre- to posttest ($p. < .001$) whereas, the control group mean gain of 5.30 was not significant. Where differences in mean gains for the two groups is compared (8.60) the difference is significant at the .10 level. While this significance level is not stringent in the tradtional sense it strongly suggests that the experimental group outperformed controls.

Tables IIA - IID summarize the attitudinal data. These data are particularly important to the Professional Sequence at Illinois State University since student avoidance behavior of all types constitute the most serious problem for this program.

TABLE A

Instructor Concerned and Helpful

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
Experimental	88%	12%	0	0	0
Control	62.5%	25%	0	0	12.5%

TABLE B

Interest in Subject Area Stimulated

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
Experimental	71%	29%	0	0	0
Control	25%	25%	12.5%	0	37.5%

TABLE C

Quality of Lectures

	Excellent	Good	Satisfactory	Fair	Poor	Not Applicable
Experimental	76%	24%	0	0	0	0
Control	25%	62.5%	0	0	0	12.5%

TABLE D

Laboratory Ratings

	Excellent	Good	Satisfactory	Fair	Poor	Not Applicable
Experimental	88%	12%	0	0	0	0
Control	12.5%	25%	0	0	0	62.5%

TABLE E

Instructor Effectiveness

	Most Effective Among top 10%	More Effective Than Most - Among top 30%	About Average	Not as Effective As Most - Lowest 30%
Experimental	82%	18%	0	0
Control	50%	25%	12.5%	12.5%

Attitudinal measures indicate strong positive feelings expressed by experimental group members, whereas, control group members expressed neutral to negative feelings. Of particular interest was the fact that 88 percent of experimental group members rated product analysis training as excellent, whereas, only 12.5% of the control group rated their microteaching laboratory experiences as excellent. Further, experimental subjects completed all pre-student teaching requirements within the semester time period, whereas, control subjects performed at about the same level as regular Professional Sequence students.

Discussion

Our study indicates that pupil outcomes can be used to increase the performance and attitudes of prospective teachers. This can be explained by "instructor attitude" factors. Product analysis is a new procedure, whereas, using traditional classroom procedures to supplement individualized learning packages is not. However, rival explanations cannot be dismissed. Product analysis provided prospective teachers with subject-matter that is both valid and functional. It also provided them with positive reinforcement for demonstrating increasingly higher levels of self-improvement skills directly related to this subject-matter. Much of the subject-matter included in CBTE programs, including the Illinois State University program, is not valid, and it lacks clear utility in helping prospective teachers learn to teach. Control group members

spent all of their time demonstrating that they had learned this subject-matter. Unlike the experimental group they did not receive quantiative feedback of the effects of their behavior on pupil outcomes; they did not compare performance feedback to standards; they did not compute individual scores item by item to abstract cues for altering their behavior; and they did not attain additional performance feedback on the effects of their self-improvements on pupil outcomes. The control group was distracted from acquiring these insights by having to memorize subject-matter believed by others to be useful for teaching. Additional work needs to be done with larger samples to check these initial findings. A major objective of future studies will be to determine how much of what we now teach prospective teachers might be eliminated, and how much they can learn from self-regulated experiences about what works best for them in classrooms.

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